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H4R RCSS R17D R17E R17V

(56) Documents Cited
GB 2117210 A GB 1586543 A GB 1272594 A
EP 0158548 A1 EP 0118161 A1 US 4947244 A
US 4920432 A US 4885803 A

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UK CL (Edition N) H4R RCSS
INT CL[6] H04H 1/02, H04N 7/173

(54) **Video transmission systems**

(57) A video transmission system comprises a transmitting station 1 and a plurality of, e.g. eight, receiving stations 3.

A selected video signal is transmitted from the transmitting station 1 to a receiving station 3 in accordance with a channel selection signal inputted by a user at the receiving station 3, e.g. using an infra-red remote control.

The system is applied to existing structured cabling networks 4 in which cabling is provided in the form of four twisted pairs of conductors in which it is not normally possible to transmit a plurality of video signals simultaneously along such conductors. By providing such a return path, it is possible to retain user selection from a plurality of video signals, while permitting such a system to be retro-fitted on to existing structured cabling networks.

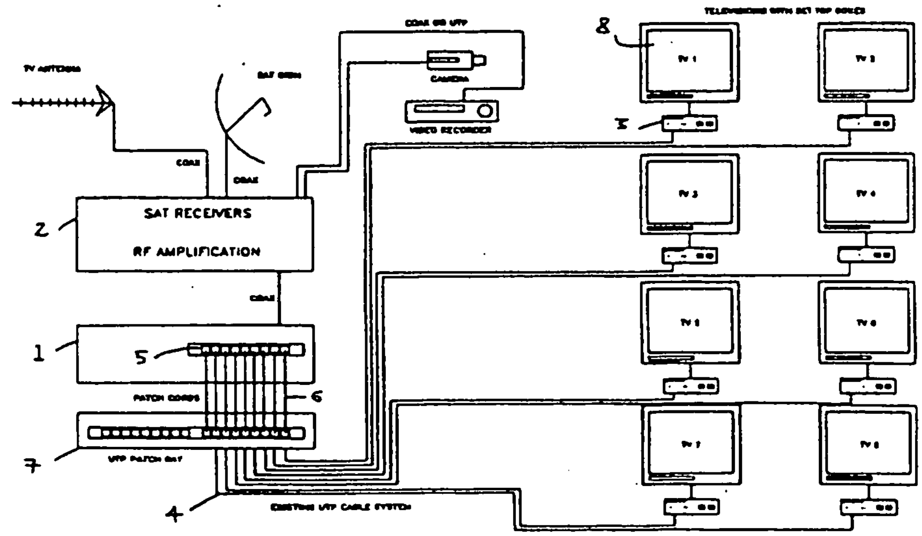

FIG. 1

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

This print incorporates corrections made under Section 117(1) of the Patents Act 1977.

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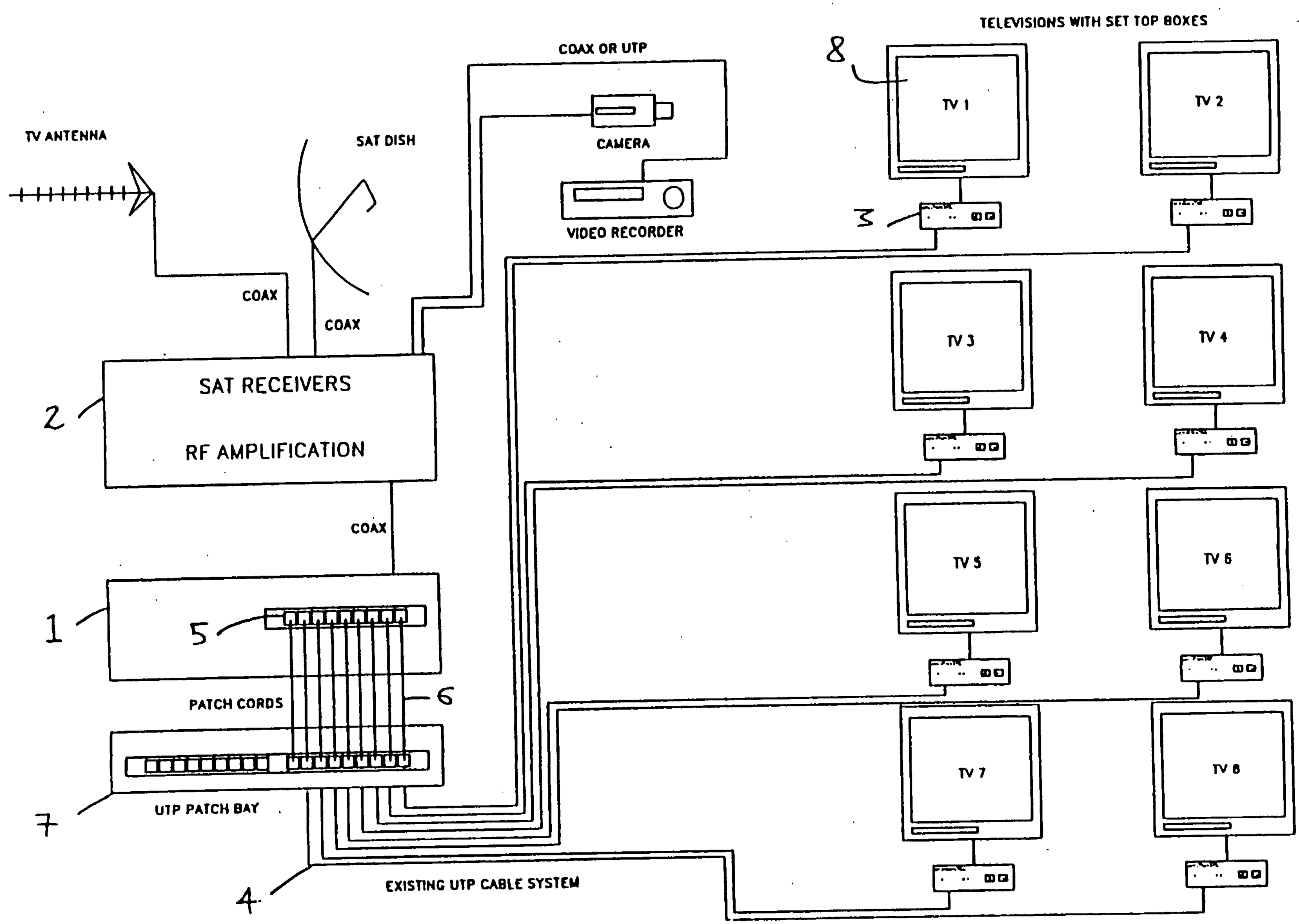

TV ANTENNA
SAT DISH
COAX
COAX
COAX OR UTP
CAMERA
VIDEO RECORDER
TELEVISIONS WITH SET TOP BOXES
TV 1
TV 2
TV 3
TV 4
TV 5
TV 6
TV 7
TV 8
SAT RECEIVERS
RF AMPLIFICATION
COAX
PATCH CORDS
UTP PATCH BAY
EXISTING UTP CABLE SYSTEM
1
2
3
4
5
6
7
8

FIG. 1

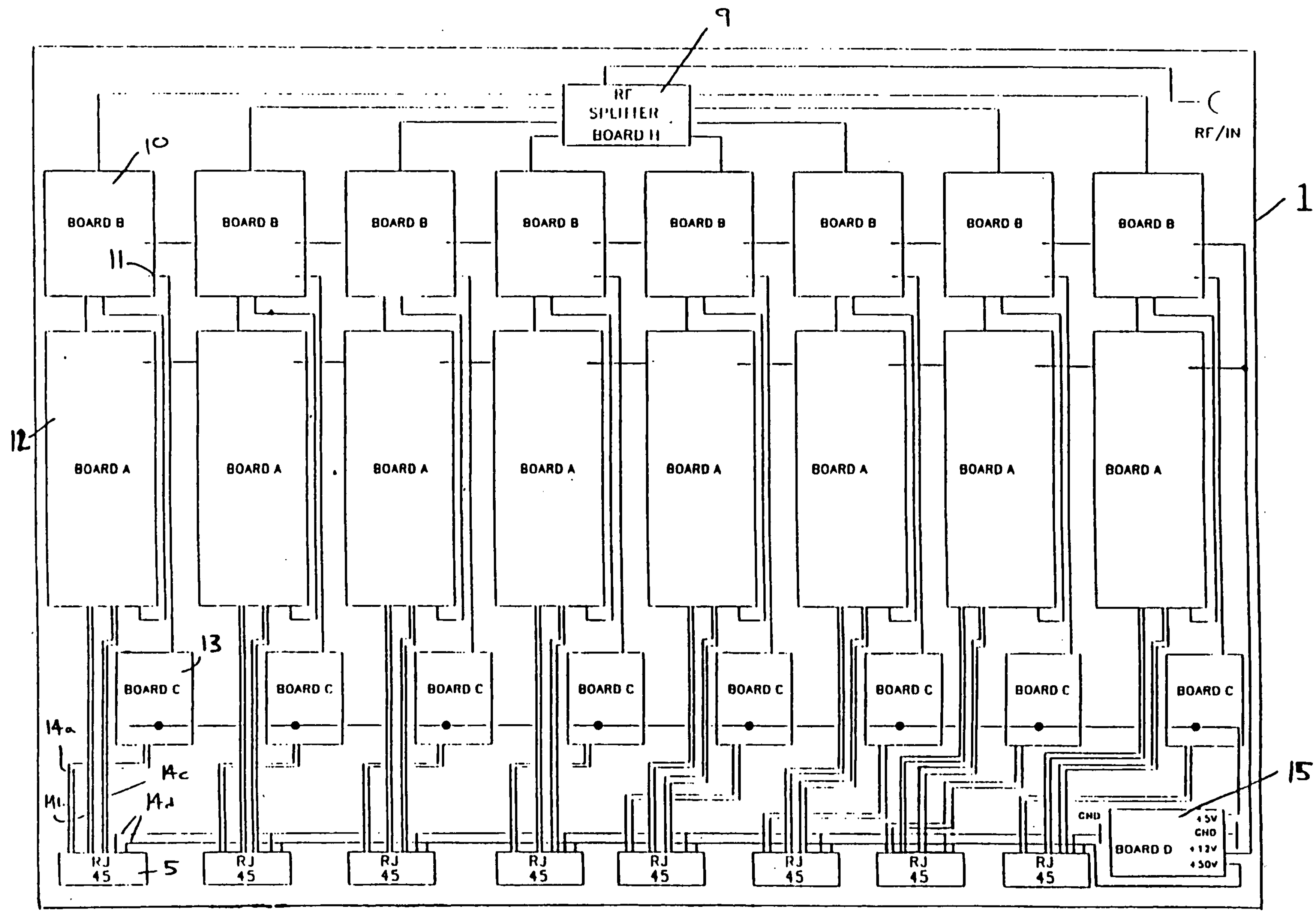

9
RF SPLITTER BOARD II
RF/IN
1
10
11
12
13
BOARD B
BOARD A
BOARD C
BOARD D
+5V
GND
+12V
+30V
GND
RJ 45
14a
14b
14c
14d
5
15

FIG. 2

3/4

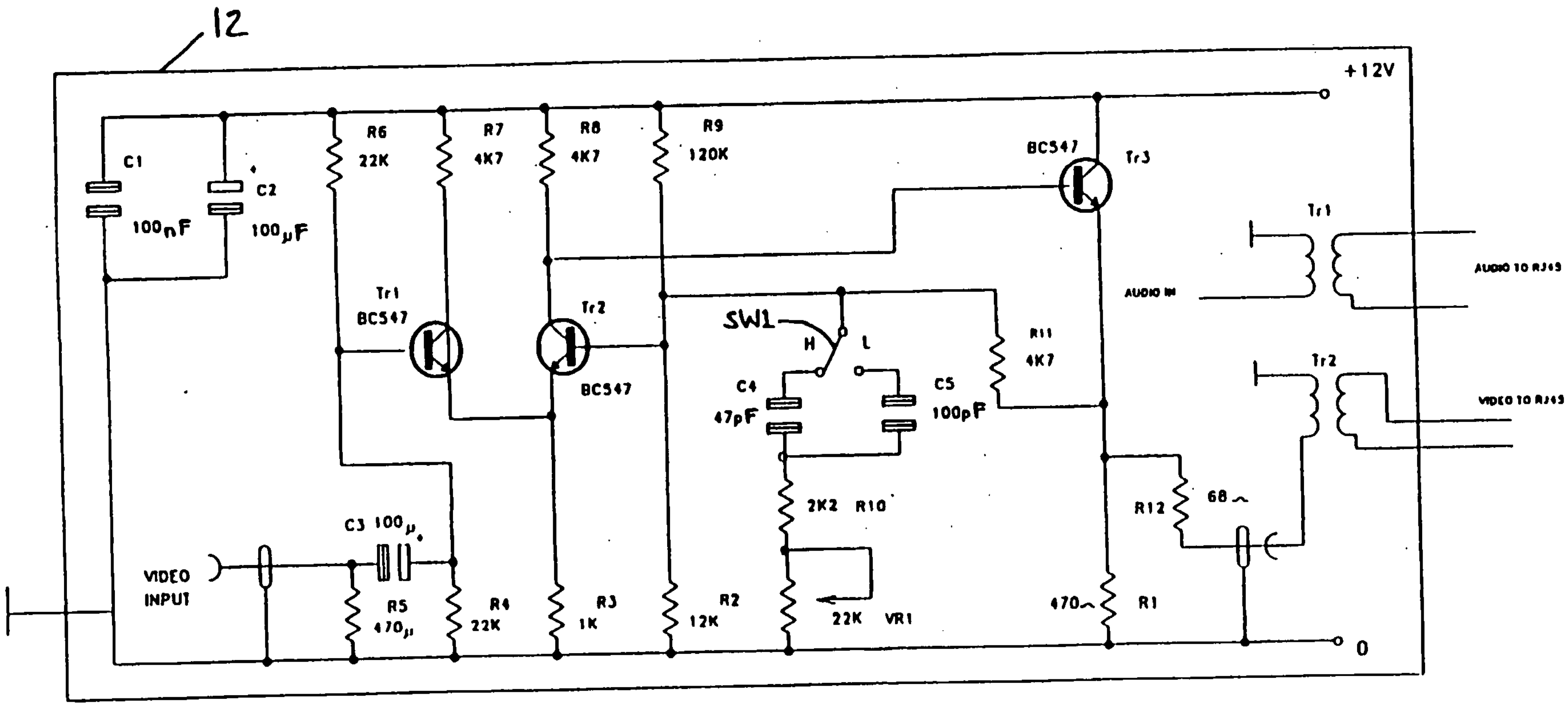
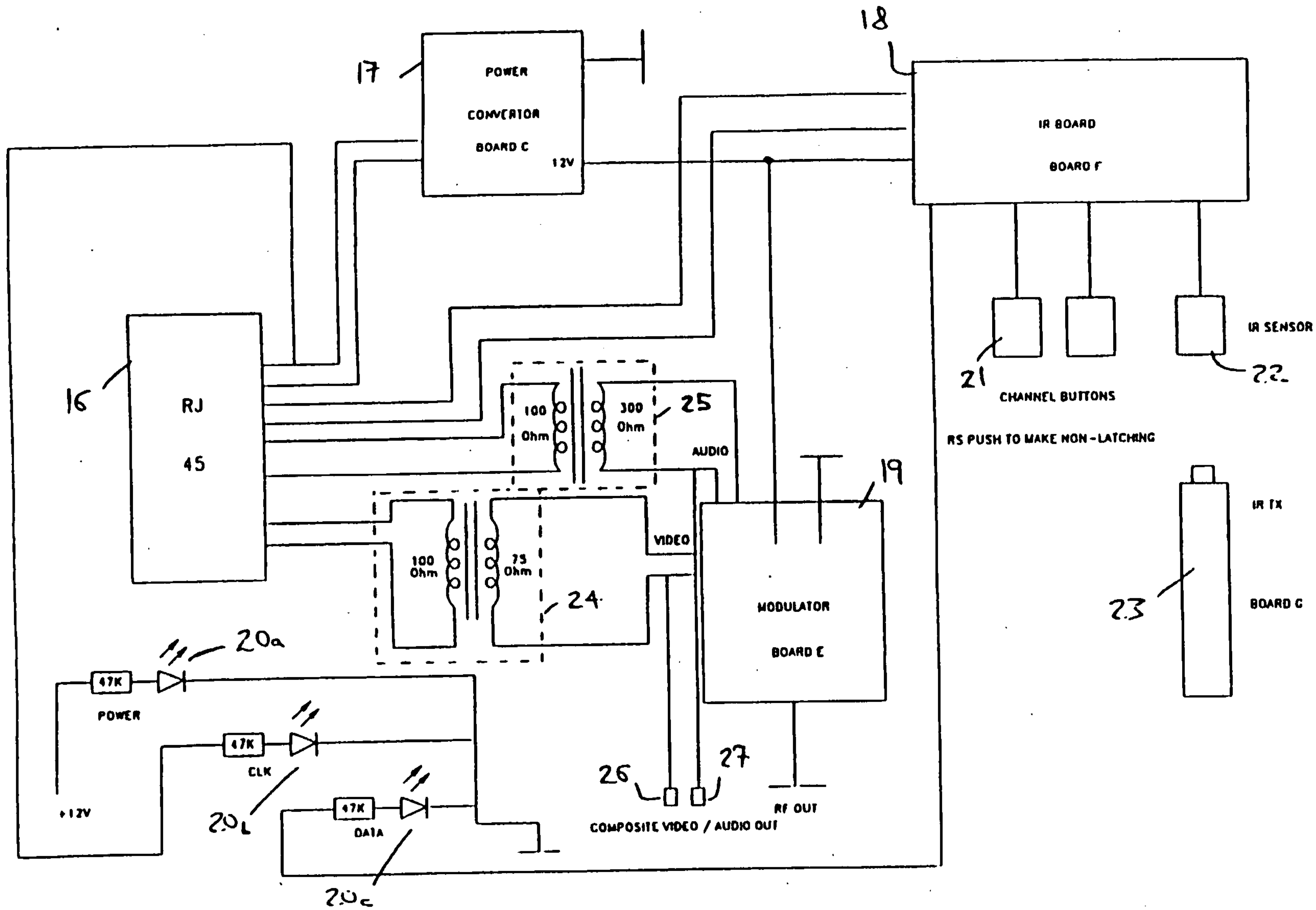

12
+12V
C1
100nF
C2
100µF
R6
22K
R7
4K7
R8
4K7
R9
120K
Tr1
BC547
Tr2
BC547
BC547
Tr3
SW1
H
L
C4
47pF
C5
100pF
R11
4K7
AUDIO IN
Tr1
AUDIO TO RJ45
Tr2
VIDEO TO RJ45
2K2 R10
R12
68~
VIDEO
INPUT
C3 100µ
R5
470µ
R4
22K
R3
1K
R2
12K
22K VR1
470~
R1
0

FIG. 3

4/4



POWER
CONVERTOR
BOARD C
12V
17
18
IR BOARD
BOARD F
16
RJ
45
100
Ohm
300
Ohm
25
AUDIO
100
Ohm
75
Ohm
24
VIDEO
19
MODULATOR
BOARD E
RF OUT
26
27
COMPOSITE VIDEO / AUDIO OUT
21
CHANNEL BUTTONS
RS PUSH TO MAKE NON-LATCHING
IR SENSOR
22
IR TX
BOARD G
23
20a
47K
POWER
+12V
47K
CLK
20b
47K
DATA
20c

FIG. 4

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DATA TRANSMISSION SYSTEMS

The present invention relates generally to data transmission systems and, in particular, to such systems for transmitting a video signal selected from a plurality of such video signals.

One problem often encountered in data transmission systems is the limitation in the available bandwidth. Thus, when transmitting a plurality of video signals simultaneously, a high bandwidth is required. This requirement can be met to some extent by modulating the video signals on respective radio-frequency carrier signals and transmitting the resulting modulated signals along coaxial cable.

However, in a working environment, it is often desired to receive different video signals and at different locations. Furthermore, such locations frequently need to be changed.

A similar problem has been found to exist with telephones and computer systems. To meet this problem there has been developed a system known as structured cabling, wherein offices are equipped with a grid of cables which enables office personnel to connect telephone handsets and computer terminals at selected locations throughout the office building.

The standard cabling in such systems is in the form of four twisted pairs of screened or unscreened copper conductors. Such cabling is known by the proprietary names such as, for example, AT&T, Systmax and ITT Datacomms.

It is not possible, at least without data compression techniques, to transmit a plurality of video signals simultaneously along such a twisted pair of conductors. To enable a plurality of video signals to be transmitted, it would of course be possible to add suitable coaxial cabling to such an arrangement. However, such an addition would be

extremely expensive and time-consuming, since the entire grid would have to be supplemented by such coaxial cable in order for the versatility of the existing telephone and computer network to be achieved in a video transmission network.

It would therefore be desirable to provide means by which the existing cabling in a building could be utilised to enable transmission of a video signal selected by a user at a receiving station without the need for supplementing such cabling with coaxial cable.

It would further be desirable to provide a system enabling such a video signal to be transmitted up to a distance of about 400 metres.

In accordance with a first aspect of the present invention there is provided a system for transmitting video data from a transmitting station to a receiving station, the transmitting station being arranged to transmit a selected one of a plurality of video signals in dependence on a selection signal received from said receiving station.

In accordance with a second aspect of the present invention there is provided a transmitter for transmitting video data to a remote receiving station, the transmitter being arranged to transmit a selected one of a plurality of video signals in dependence on a selection signal received from said receiving station.

In accordance with a third aspect of the present invention there is provided a receiver for receiving video data from a remote transmitting station, the receiver comprising means for transmitting to said transmitting station a selection signal for determining which one of a plurality of video signals is to be transmitted by said transmitting station to said receiver.

Thus the present invention, by making use of a return path from the receiving station to the transmitting station along which a channel selection signal can be transmitted, there is no longer the need for a plurality of video signals to be transmitted simultaneously along the same cable.

The invention is particularly advantageous in buildings provided with structured cabling, since one of the twisted pairs of conductors may conveniently carry the channel selection signal, with one of the other twisted pairs carrying the selected video signal. Thus, in such a building, a system in accordance with the present invention can be conveniently applied without the need for additional cabling between the transmitting station and the receiving stations.

A preferred embodiment of the invention will now be described with reference to the accompanying drawings, wherein:

Figure 1 is a schematic representation of the data transmission system of the preferred embodiment;

Figure 2 is a schematic representation of the transmitting station of the arrangement shown in Figure 1;

Figure 3 is a circuit diagram of a selective amplifying circuit used in the preferred embodiment of the present invention; and

Figure 4 is a schematic representation of one of the receiving stations of the arrangement shown in Figure 1.

In Figure 1 there is shown a transmitting station 1 connected to a source 2 of video signals derived from a television antenna, a satellite receiver, a video camera and a video recorder. All of the video signals at this stage are modulated on respective radio-frequency carrier signals,

each respective carrier signal representing a separate channel with a corresponding carrier signal frequency.

The transmitting station 1 serves to demodulate video signals selected on the basis of digital selection signals received from corresponding receiving stations 3. The demodulated video signals are transmitted into a structured cabling network 4, and the digital selection signals are received from the structured cabling network 4 by means of standard RJ45 sockets 5 in the transmitting station. Patch cords 6 are used to effect suitable connection to those locations where a receiving station 3 is situated, by means of a standard patch-board 7 associated with structured cabling networks. In this way, the receiving stations 3 can readily be re-located, and re-connection is established simply by suitable re-connection of the patch cords 6 in the patch-board 7.

Each receiving station 3 is provided with means enabling a user to select a desired video signal and a respective television monitor 8.

The transmitting station 1 is shown in greater detail in Figure 2.

The incoming modulated video signals are supplied to an eight-way passive signal splitter 9 which distributes the same combination of video signals to eight tuners 10. The splitter 9 serves additionally to ensure effective isolation between the respective outputs. A suitable passive signal splitter is manufactured by Fuba Electronics.

Each tuner 10 selects a single video signal in dependence on an analog tuning signal received at a tuning signal input port 11 which determines the carrier signal frequency associated with the desired video signal.

The selected video signal is then demodulated and converted into a digital composite video signal having an impedance of 75 ohms and a peak-to-peak range of 1 volt. This composite video signal is fed to a selective amplifying circuit 12 which serves to boost the high-frequency components of the composite video signal. The high-frequency components of the composite video signal include the chrominance and the luminance signal components.

The reason for including the selective amplifying circuit 12 is that, when video signals are transmitted over a considerable distance, it is found that the intensity of such high-frequency components becomes reduced, and it is therefore necessary to boost these signal components.

A circuit diagram of the selective amplification circuit 12 is shown in Figure 3.

This circuit is a three-stage amplifier, transistors Tr1 and Tr2 forming a long-tailed pair, with transistor Tr3 constituting an emitter-buffer-stage transistor. The gain of the circuit is controlled by resistors R2, R9 and R11. This network provides the circuit with unity gain, but the high-frequency components are increased by incorporating high-frequency capacitors C4 and C5. The values of these capacitances is chosen such that their impedance is low at high frequencies, thereby to increase the amplification at these frequencies. A switch SW1 is provided to select between capacitors C4 and C5 so as to lower or raise the values of the frequencies which are amplified. The choice of which capacitance value to use will be determined by the length of the cabling between the transmitting station 1 and the receiving stations 3.

A potentiometer VR1 is provided in series with the chosen capacitor, C4 or C5, and this can be adjusted so as to reduce the gain, if desired.

At the output of the selective amplifying circuit 12 there is provided an impedance-matching transformer Tr2 which matches the 75 ohms impedance of the composite video signal to that of the associated twisted pair cable of the structured cabling network 4, which is typically 100 ohms.

The audio signal is supplied directly to a second impedance-matching transformer Tr1, there being no requirement to amplify the audio signal, since the losses in its associated twisted pair cable within the structured cabling network 4 are negligible.

Returning to Figure 2, it can be seen that the composite video and audio signals outputted from the selective amplifying circuits 12 are fed to respective patch-board sockets 5.

Each of the eight tuners 10 of the transmitting station 1 has an associated digital-to-analog converter 13 for converting the digital channel selection signals, transmitted from the respective receiving station, into corresponding analog tuning signals which are fed to each tuner 10.

The structured cabling network 4 uses four twisted pairs of conductors 14a, 14b, 14c and 14d. The first twisted pair 14a is used to transmit the digital channel select signals from the corresponding receiving station 3 to the transmitting station 1. The second twisted pair 14b is used to transmit the selected composite video signal from the transmitting station 1 to the appropriate receiving station 3. The third twisted pair 14c is used to transmit the audio signal from the transmitting station 1 to the appropriate receiving station 3. Finally, the fourth twisted pair 14d is used to power the receiving station 3.

The transmitting station 1 is provided with a power supply 15 which provides power for the tuners 10, the selective

amplifying circuits 12 and the receiving stations 3. The power supply 15 typically comprises a transformer bridge rectifier, voltage regulators and associated smoothing components (not shown).
The power supply 15 provides voltage rail levels as follows:

+ 5 volts for the digital-to-analog converters 13;

+ 12 volts for the tuners 10;

+ 12 volts for the selective amplifying circuits 12; and

+ 50 volts for the receiving stations 3.

The + 50 volts is applied to the fourth twisted pair 14d, and this is used to power the respective receiving stations 3.

One of the eight receiving stations 3 is represented in Figure 4. The receiving station 3 is connected to the structured cabling network by means of a standard RJ45 socket 16.

The receiving station 3 is powered by the d.c. voltage level on the fourth twisted pair of the structured cabling network. This d.c. voltage is supplied to a power converter board 17 which converts the voltage level to 12 volts d.c. which is used to power the respective components of the receiving station 3, these being a channel selection module 18, a modulator 19 and various indicator lights 20a, 20b and 20c. The power converter board 17 serves to ensure that a stable voltage level is supplied to these components, irrespective of any voltage drop occurring along the structured cabling network.

Channel selection is effected by means of the channel selection module 18. To select a desired video channel, a

user depresses an appropriate channel selection button 21, or a channel increase or channel decrease button an appropriate number of times. Channel selection buttons 21 are provided on the channel selection module 18. The channel selection module 18 is additionally provided with an infrared sensor 22 for sensing channel selecting signals emitted from a corresponding infrared remote control transmitter 23 operable by the user. The channel selection module 18 is arranged to output the digital selection signals.

Both the channel selection module 18 and the infrared remote control transmitter 23 are commonly available components and may, for example, be obtained from Maplin Electronics, of Rayleigh, Essex, U.K.

The composite video and audio signals transmitted along the structured cabling network are supplied to respective impedance-matching transformers 24, 25 for matching the impedance (100 ohms) of the second and third twisted pairs of the structured cabling network to respective desired impedance levels (75 ohms and 300 ohms) for the output video and audio signals. The impedance-matched composite video and audio signals are supplied to the modulator 19 which re-modulates these signals on a radio-frequency carrier signal. The resulting modulated signal can then be supplied to a standard television monitor tuned to the frequency of the carrier signal.

The impedance-matched composite video and audio signals are, however, additionally supplied respectively direct to output terminals 26 and 27, so that television monitors and personal computers which are adapted to receive unmodulated video and audio signals may be employed, if desired. Clearly, signal quality is improved if the composite video and audio signals are fed directly to a television monitor, since this avoids the need for modulation, and subsequent demodulation within the television receiver, which

inevitably degrades the quality of the signal.

The indicator lights 20a, 20b and 20c are powered by the power converter board 17. Light 20a serves to indicate when the receiving station 3 is correctly powered, light 20b indicates that the receiving station 3 has been connected to the transmitting station and light 20c indicates when a channel is being selected.

Although the present invention has been described with reference to a preferred embodiment, many modifications may be made without departing from the scope of the invention.

For example, although the channel selection is achieved in the preferred embodiment by selecting the frequency of the radio-frequency carrier signal at which the desired video signals are modulated, and tuning the signal accordingly, it would be possible for a selection to be made between different video signals which have been modulated at the same radio-frequency carrier signal. This situation could occur, for example, where several television cameras are employed, each delivering an output video signal modulated at the same radio-frequency carrier frequency.

CLAIMS

1. A system for transmitting video data from a transmitting station to a receiving station, the transmitting station being arranged to transmit a selected one of a plurality of video signals in dependence on a selection signal received from said receiving station.

2. A transmitter for transmitting video data to a remote receiving station, the transmitter being arranged to transmit a selected one of a plurality of video signals in dependence on a selection signal received from said receiving station.

3. A transmitter as claimed in claim 2, the transmitter comprising means for receiving said plurality of video signals in a modulated state and means for demodulating the selected video signal and for transmitting said video signal as a digital composite video signal.

4. A transmitter as claimed in claim 2 or claim 3, the transmitter comprising means for amplifying selected components of the selected video signal.

5. A transmitter as claimed in claim 4, wherein said selected components comprise high-frequency components.

6. A transmitter as claimed in claim 4 or claim 5, wherein said selected components comprise chrominance signals.

7. A transmitter as claimed in any one of claims 4 to 6, wherein said selected components comprise luminance signals.

8. A transmitter as claimed in any one of claims 4 to 7, further comprising means enabling a user to adjust said amplifying means.

9. A transmitter as claimed in any one of claims 2 to 8, wherein the selection signal to be received from the receiving station is a digital signal, the transmitter further comprising a digital-to-analog converter for converting said digital selection signal into an analog tuning signal.

10. A transmitter as claimed in any one of claims 2 to 9, and comprising a plurality of tuning means, each responsive to a channel selection signal received form a respective receiving station.

11. A transmitter as claimed in claim 10, wherein said plurality of tuning means comprises eight tuning means.

12. A transmitter as claimed in any one of claims 2 to 11, arranged to transmit said selected video signal along a cable.

13. A transmitter as claimed in claim 12, further comprising impedance-matching means at the output of the transmitter.

14. A transmitter as claimed in claim 13, wherein said impedance-matching means comprises an impedance-matching transformer.

15. A receiver for receiving video data from a remote transmitting station, the receiver comprising means for transmitting to said transmitting station a selection signal for determining which one of a plurality of video signals is to be transmitted by said transmitting station to said receiver.

16. A receiver as claimed in claim 15, arranged to receive said one video signal as a digital composite video signal, said receiver further comprising means for modulating said video signal.

17. A receiver as claimed in claim 15 or claim 16, arranged to receive said selected video signal when transmitted along a cable.

18. A receiver as claimed in claim 17, further comprising mean for receiving electrical power from said transmitting means.

19. A receiver as claimed in claim 17 or claim 18, further comprising impedance-matching means at the input of the receiver.

20. A receiver as claimed in claim 19, wherein said impedance-matching means comprises an impedance-matching transformer.

21. A receiver as claimed in any one of claims 15 to 20, further comprising a remote control means enabling a user to select a video signal remotely from the receiver.

22. A receiver as claimed in claim 21, wherein said remote control means is arranged to be operated by infrared signals.

23. A system for transmitting video data from a transmitting station to a receiving station substantially as hereinbefore described with reference to the accompanying drawings.

24. A transmitter for transmitting video data to a remote receiving station substantially as hereinbefore described with reference to the accompanying drawings.

25. A receiver for receiving video data from a remote transmitting station substantially as hereinbefore described with reference to the accompanying drawings.

13

Patents Act 1977 **Examiner's report to the Comptroller under Section 17** **'he Search report)**	Application number GB 9425217.8
Relevant Technical Fields (i) UK Cl (Ed.N) H4R (RCSS) (ii) Int Cl (Ed.6) H04N 7/173; H04H 1/02	Search Examiner MR K WILLIAMS Date of completion of Search 9 FEBRUARY 1995
Databases (see below) (i) UK Patent Office collections of GB, EP, WO and US patent specifications. (ii)	Documents considered relevant following a search in respect of Claims :- 1-25

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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A: Document indicating technological background and/or state of the art.

P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family; corresponding document.

Category	Identity of document and relevant passages		Relevant to claim(s)
X	GB 2117210 A	(FENNING) whole specification	1, 2, 12, 15, 17
X	GB 1586543 A	(COMMUNICATIONS PATENTS) whole specification	1, 2, 12-15, 17-20
X	GB 1272594 A	(COMMUNICATIONS PATENTS) whole specification	1, 2, 12, 15, 17
X	EP 0158548 A1	(INTERNATIONAL STANDARD ELECTRIC) whole specification	1, 2, 12, 15, 17
X	EP 0118161 A1	(ROBERT SCHMITZ CONSULT) whole specification	1, 2, 12, 15, 17
X	US 4947244	(ON COMMAND VIDEO) whole specification)	1, 2, 12, 15, 17, 21
X	US 4920432	(EGGERS ET AL) whole specification	1, 2, 12, 15, 17
X	US 4885803	(HERMANN) whole specification	1, 2, 12, 15, 17, 21, 22

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